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(54) **Method and apparatus for coordinating memory operations among diversely-located memory components**

(57) A method and apparatus for coordinating memory operations among diversely-located memory components is described. In accordance with an embodiment of the invention, wave-pipelining is implemented for an address bus coupled, to a plurality of memory compo-

nents. The plurality of memory components are configured according to coordinates relating to the address bus propagation delay and the data bus propagation delay. A timing signal associated with address and/or control signals which duplicates the propagation delay of these signals is used to coordinate memory operations.

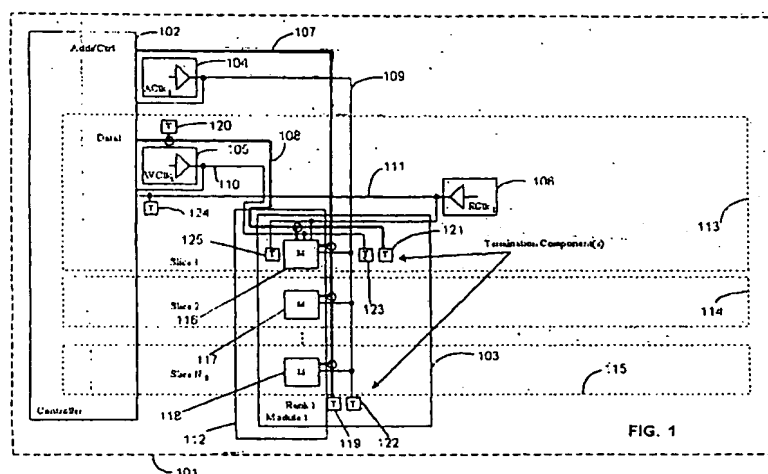


FIG. 1



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EUROPEAN SEARCH REPORT

Application Number
EP 05 02 2021

DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
X	US 6 125 419 A (UMEMURA ET AL) 26 September 2000 (2000-09-26) * column 16, line 34 - column 17, line 34; figures 14,16 * * column 23, line 32 - line 53; figure 25 * -----	1-18	INV. G06F13/16
A	US 5 892 981 A (WIGGERS ET AL) 6 April 1999 (1999-04-06) * abstract * * column 4, line 42 - line 54 * * -----		
A	WO 99/41667 A (INTEL CORPORATION; HOLMAN, THOMAS, J) 19 August 1999 (1999-08-19) * page 2, paragraph 2 * * page 14, paragraph 2; figure 3 * * figure 12 * * -----		
A	EP 0 735 492 A (MOTOROLA, INC) 2 October 1996 (1996-10-02) * column 2, line 55 - column 3, line 28 * * figures 1-3 * * -----		
			TECHNICAL FIELDS SEARCHED (IPC)
			G06F
The present search report has been drawn up for all claims			
Place of search Munich		Date of completion of the search 1 June 2006	Examiner Jünger, B
CATEGORY OF CITED DOCUMENTS X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document		T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document	

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EPO FORM 1503 (03.02.92) (P04C01)

**ANNEX TO THE EUROPEAN SEARCH REPORT
ON EUROPEAN PATENT APPLICATION NO.**

EP 05 02 2021

This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report.
The members are as contained in the European Patent Office EDP file on
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01-06-2006

Patent document cited in search report		Publication date	Patent family member(s)	Publication date
US 6125419	A	26-09-2000	NONE	
US 5892981	A	06-04-1999	DE 69709885 D1	28-02-2002
			DE 69709885 T2	27-06-2002
			EP 0931291 A1	28-07-1999
			JP 2001505684 T	24-04-2001
			WO 9815897 A1	16-04-1998
WO 9941667	A	19-08-1999	AU 2483099 A	30-08-1999
			DE 19982871 T0	29-03-2001
			GB 2349965 A	15-11-2000
			HK 1028467 A1	24-10-2003
			US 6968419 B1	22-11-2005
EP 0735492	A	02-10-1996	JP 3616453 B2	02-02-2005
			JP 8287008 A	01-11-1996
			TW 594479 B	21-06-2004
			US 5638520 A	10-06-1997

EPO FORM P0459

For more details about this annex : see Official Journal of the European Patent Office, No. 12/82

**Bescheid/Protokoll (Anlage)****Communication/Minutes (Annex)****Notification/Procès-verbal (Annexe)**Datum
Date
Date

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1

Anmelde-Nr.:
Application No.: 05 022 021.9
Demande n°:

The examination is being carried out on the following application documents:

Description, Pages

1-98 as originally filed

Claims, Numbers

1-18 as originally filed

Drawings, Sheets

1-34 as originally filed

Reference is made to the following document/s; the numbering will be adhered to in the rest of the procedure:

D1: US-A-6 125 419 (UMEMURA ET AL) 26 September 2000 (2000-09-26)

- 1 The divisional application does not comply with Article 76 because it extends beyond the content of the earlier application as filed. The reasons being as follows:
 - 1.1 The earlier application as filed, discloses e.g. in figure 32 and associated text a memory system similar to the subject matter of claim 1, wherein each control/address wire is routed onto a memory module, past all the memory components, and into a termination component.
 - 1.2 However, the claim features "a third plurality of signal lines" which also covers other signal lines than control/address signal lines and therefore extends beyond the content of the earlier application as filed.
- 2 Under Article 84 in combination with Rule 29(2) EPC an application may contain more than one independent claim in a particular category only if the subject matter claimed falls within one or more of the exceptional situations set out in paragraphs (a), (b) or (c) of Rule 29(2) EPC. The independent system claims 1 and 14 however, do not fulfil any of the conditions (a) to (c) of this Rule.

These claims define a memory system for essentially the same object and not for objects that work together. Hence, they are not inter-related systems nor different uses of a product or apparatus.

The memory systems also cannot be considered as alternative solutions to a particular problem in the sense of different or even mutually exclusive possibilities,



but to one and the same solution with slightly different wording and level of detail.

Moreover, the examining division does not see any reason why it should not be possible, practical or otherwise not be appropriate to cover the subject matter by a single independent claim. It is considered entirely appropriate to select a common wording for the essential features and draft a single independent claim with dependent claims as necessary.

- 3 The present application does not meet the requirements of Article 52(1) EPC, because the subject-matter of claim 1 is not new in the sense of Article 54(1) and (2) EPC. The document D1 discloses all features of claim 1 (the references in parentheses applying to this document):
- a) A memory system (fig. 14) comprising a first memory device (fig. 14, #1) and a first plurality of signal lines coupled to the first memory device, the first plurality of signal lines dedicated to data transfers involving the first memory device (fig. 14, data bus signal lines connected at memory device #1)
 - b) the memory system further comprises a second memory device (fig. 14, #3) and a second plurality of signal lines coupled to the second memory device, the second plurality of signal lines dedicated to data transfers involving the second memory device (fig. 14, data bus signal lines connected at memory device #3)
 - c) a first termination component (fig. 15, item 59b)
 - d) a third plurality of signal lines coupled to the first memory device, the second memory device, and the first termination component such that a signal propagating on the third plurality of signal lines propagates past the first memory device before reaching the second memory device and propagates past the second memory device before reaching the first termination component (fig. 16, item 5b and col. 16 l. 34-col. 17 l. 34 and fig. 25)

Remark: The topology shown in the figures implies the signal propagation as claimed in feature d).

- 4 In the dependent claims a number of minor modifications to the memory system of claim 1 are set out, all of which, when not directly deductible from the teachings of



document D1 relate to routine measures normally to be expected from the skilled person. It thus appears that all features of the dependent claims are either known from or rendered obvious by the prior art (Art. 54 and 56 EPC).

- 5 It is not at present apparent which part of the application could serve as a basis for a new, allowable claim. Should the applicant nevertheless regard some particular matter as patentable he is invited to file an independent claim including such matter.

In that case

- 5.1 The applicant is requested to clearly identify all amendments made and indicate from which passages of the original application these amendments are directly and unambiguously derivable (Article 123(2) EPC and Guidelines C-VI, 5.3.1 and E-II, 1). If the applicant regards it as appropriate these indications could be submitted in handwritten form on a copy of the relevant parts of the application as filed.
- 5.2 The applicant should not only indicate in the letter of reply the difference of the subject-matter of the new claim vis-a-vis the state of the art, but should also especially indicate the technical effect achieved thereof as well as the reasons for which the claimed matter should contribute to an inventive step (problem/solution approach) over the available prior art D1.
- 5.3 D1 is considered as most relevant source of prior art. The independent claims should be drafted in two-part form (Rule 29(1) EPC) using the words "characterized by", with those features which in combination are known from D1 being placed in the preamble.
- 5.4 D1 should be acknowledged in the introductory part of the description (Rule 27 (1) (b) EPC).
- 5.5 All claims should contain reference signs (Rule 29(7) EPC).
- 5.6 The description should be adapted to the new claims to be filed (Rule 27(1)(c) EPC).
- 5.7 The statement referring to the spirit and scope of the invention in the description at page 86 is inconsistent with the definition of the matter for which protection is sought, contrary to Article 84 EPC. The statement should therefore be deleted.